B. Remarks/Arguments:

Introduction

Claims 1-5 and 7-15 are pending. Claims 1, 12 and 14 have been amended to further describe the cooling steps of the present invention. Support for these amendments will be discussed in conjunction with the discussion of the Section 112 rejections.

Request for Withdrawal of Final Rejections

At page 4, first paragraph of the Action, claims 1-5 and 8-15 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,125,653 to Shu et al. (hereinafter "Shu") in view of either U.S. Patent No. 6,116,050 to Yao et al. (hereinafter "Yao") or U.S. Patent No. 5,568,737 to Campbell et al. (hereinafter "Campbell") or U.S. Patent No. 5,890,377 to Foglietta (hereinafter "Foglietta").

The Action, however, at pages 4-5 fails to present any arguments regarding the secondary references, i.e., Yao, Campbell or Foglietta. Thus, the Action fails to present a *prima facie* case of obviousness because it fails to present any arguments relating to the secondary references. As it would be unfair to the Applicants to argue against such incomplete Section 103 rejections, Applicants respectfully request withdrawal of this final rejection for the Section 103 rejections.

Section 112 Rejections

Claims 1-5 and 8-15 are rejected under 35 U.S.C. §112, first paragraph. The Action alleges (1) that the limitation of "substantially condensed hydrocarbon feed stream" in claims 1, 4, 12 and 14 and (2) that the limitation of "cooling the hydrocarbon gas stream to provide a vapor hydrocarbon feed stream and a condensed liquid hydrocarbon stream" in lines 6-7 of claim 12 were not adequately described in the specification.

While the Applicants do not agree with such rejections, claims 1, 12 and 14 have been amended to advance prosecution on the merits.

Steps (b) of claims 1, 12 and 14 have been amended to recite "cooling the hydrocarbon gas stream to provide a partially condensed feed stream." Support for cooling the feed stream is described in paragraphs [0023] through [0025]. Further, in paragraph [0025] the cooled feed stream is described as being partially condensed.

Step (c) of claims 1, 12 and 14 are directed to separating the partially condensed feed stream to form a vapor stream and a condensed liquid stream. In paragraph [0024], the partially condensed feed streams are described as being fed to a separator. In paragraph [0025], the separator is described as being useful to separate "vapor from condensed liquid." Further, the streams exiting the separator are also described as "vapor 19" and "feed liquid 25" in paragraphs [0025] and [0027], respectively.

Step (d) of claims 1, 12 and 14 describe the use of cryogenic heat exchanger. Paragraph [0025] describes the use of a cryogenic heat exchanger.

Step (e) of claims 1, 12 and 14 are directed to cooling the vapor from step (c) in the cryogenic heat exchanger by refrigeration to form a cooled and substantially condensed feed stream. Again, such recitations are presented in paragraph [0025].

Thus, amended claims 1, 12 and 14 satisfy the requirements of Section 112, first paragraph. Entry of these claim amendments is respectfully requested. Withdrawal of the Section 112 rejections is also respectfully requested.

Section 103 Rejections

As discussed above, the Section 103 rejections fail to present a *prima facie* case of obviousness because no arguments are presented in the Action for the secondary references. Withdrawal of the Section 103 rejections is respectfully requested.

Nevertheless, to advance the present case to allowance the Applicants present arguments for patentability for the present invention.

The invention as presently defined in claim 1 is directed to a process for recovering ethane from a hydrocarbon gas stream having methane, ethane and propane. The process comprises the steps of (a) providing the hydrocarbon gas stream comprising from about 50 % to about 75 % by mole methane, from about 15 % to about 40 % by mole ethane and from about 1 % to about 4 % by mole propane; (b) cooling the hydrocarbon gas stream to provide a partially condensed feed stream; (c) separating the partially condensed feed stream into a vapor stream and a condensed liquid feed stream; (d) providing a cryogenic heat exchanger; (e) cooling the vapor stream in the cryogenic heat exchanger by refrigeration to form a cooled and substantially condensed hydrocarbon feed stream; (f) separating the cooled and substantially condensed hydrocarbon feed stream into a methane-rich stream and an ethane/propane-rich stream, said methane-rich stream having a first pressure and a first temperature; (g) expanding said methane-rich stream from said first pressure to a second pressure to lower the temperature of said methane-rich stream from said first temperature to a second temperature to provide a cooling source for said refrigeration, wherein said second pressure is lower than said first pressure and further wherein said second temperature is lower than said first temperature; (h) separating said ethane/propane-rich stream into an ethane-rich stream and a propane-rich stream; and (i) recovering said ethane-rich stream.

The invention as presently defined in claim 12 is directed to a process for recovering ethane from a methane, ethane and propane containing gas stream. The process comprises the

steps of (a) providing the hydrocarbon gas stream comprising from about 50 % to about 75 % by mole methane, from about 15 % to about 40 % by mole ethane and from about 1 % to about 4 % by mole propane; (b) cooling the hydrocarbon gas stream to provide a partially condensed feed stream; (c) separating said partially condensed feed stream into a vapor hydrocarbon feed stream and a condensed liquid hydrocarbon feed stream; (d) providing a cryogenic heat exchanger; (e) cooling the vapor hydrocarbon feed stream in ~~a~~ the cryogenic heat exchanger by heat exchange with a first cooling source, a second cooling source and a third cooling source to form a cooled and substantially condensed hydrocarbon feed stream, wherein said first cooling source is said condensed liquid hydrocarbon feed stream; (f) distilling said cooled and substantially condensed hydrocarbon feed stream and said condensed liquid hydrocarbon feed stream in a demethanizer column to form a methane-rich stream and an ethane/propane-rich stream, wherein said methane-rich stream is said second cooling source; (g) compressing said methane-rich stream to form a compressed methane-rich stream; (h) cooling said compressed methane-rich stream to form a compressed methane-rich stream; (i) turboexpanding said compressed methane-rich stream to a lower pressure to provide said third cooling source for said cryogenic heat exchanger; (j) distilling said ethane/propane-rich stream in a de-ethanizer column to form an ethane-rich stream and a propane-rich stream; and (k) recovering said ethane-rich stream.

The invention as presently defined in claim 14 is directed to a process for providing a methane-rich stream from a hydrocarbon stream containing methane, ethane and propane. The process comprises the steps of (a) providing the hydrocarbon gas stream comprising from about 50 % to about 75 % by mole methane, from about 15 % to about 40 % by mole ethane and from about 1 % to about 4 by mole propane; (b) cooling the hydrocarbon gas stream to provide a partially condensed feed stream; (c) separating said partially condensed feed stream to form a vapor hydrocarbon feed stream and a condensed liquid hydrocarbon feed stream; (d) providing a cryogenic heat exchanger; (e) cooling said vapor hydrocarbon feed stream by refrigeration in said cryogenic heat exchanger to form a cooled and substantially condensed hydrocarbon feed

stream; (f) separating the cooled and substantially condensed hydrocarbon feed stream into a methane-rich stream and an ethane/propane-rich stream, said methane-rich stream having a first pressure and a first temperature; (g) expanding said methane-rich stream from said first pressure to a second pressure to lower the temperature of said methane-rich stream from said first temperature to a second temperature to provide a cooling source for said refrigeration, wherein said second pressure is lower than said first pressure and further wherein said second temperature is lower than said first temperature; and (h) recovering said methane-rich stream.

Shu not only fails to teach or suggest, *inter alia*, the use of a cryogenic heat exchanger, but also fails to teach or suggest, *inter alia*, the use of a cryogenic heat exchanger to provide a cooled and substantially condensed hydrocarbon feed stream. The feed of Shu is first cooled in a feed exchanger 102 followed by cooling in a feed expander 104. (Shu, column 3, lines 30-36). Shu fails to teach or suggest that feed exchanger 102 is a cryogenic heat exchanger.

Common understanding of the term cryogenic to the ability "of or relating to the production of very low temperature." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY 280 (10th ed. 1995). More specifically, the very low cryogenic temperatures typically refer to temperature from about -150°C (216°R) to about -53°C (396°R). (See e.g., THEODORE BAUMEISTER ET AL., MARK'S STANDARD HANDBOOK FOR MECHANICAL ENGINEERS 19-23 (8th ed. 1978) (stating that "cryogenic temperatures...range from 216 to 396°R...in literature.")). Such very cold temperatures are consistent with Shu, which describes cryogenic temperatures being about -162°C. (Shu, column 1, lines 6-7). Thus, Shu uses the term "cryogenic" consistent with common understanding to those of ordinary skill in the art. Accordingly, Shu fails to teach or suggest that heat exchanger 102 could be a cryogenic heat exchanger because while using such terminology within the patent, Shu specifically avoids such terminology in conjunction with any discussion of heat exchanger 102.

Further, Shu fails to teach or suggest the use of a cryogenic heat exchanger to provide a cooled and substantially condensed liquid feed stream. If the operation heat exchanger 102 of the Shu were somehow modified to produce substantial quantities of liquids, then the required feed expander 104 of Shu would be inoperable. As well known to those skilled in the art and as described in previous submissions, turboexpanders cannot operate at Shu's required pressure reduction factor of 2-5 (Shu, column 3, lines 32-22) while either feeding or generating significant quantities of liquids. Thus, modification of the heat exchanger 102 to cryogenically produce substantial liquids would render feed expander 104 inoperable for its intended purpose. An inoperable reference cannot form a basis for a *prima facie* case of obviousness. *In re Gordon et al.*, 221 U.S.P.Q. 1125, 1127 (CAFC 1984). Further, such an inoperable reference is a teaching away of the present invention. *Id.* Thus, the assertion at page 5 of the Action, which states that "the modification process of Shu would provide a cooled feed, which is substantially condensed as claimed", is contrary to the express teachings of Shu and cannot form a basis for a *prima facie* case of obviousness.

Further, the Action alleges that the claimed feed concentration of step (a) of claims 1, 12 and 14 are obvious. Applicants traverse.

The Action takes the broad language of Shu stating that the "gas feed for the process may comprise any gaseous mixture of hydrocarbons containing at least some methane" (Shu, column 3, lines 22-23) to attempt to present a *prima facie* case of obviousness. The process of Shu, however, is not operable with the claimed feed. As described in the previous response, if one would attempt to send the claimed feed to the process of Shu, Shu's turbo-expander and/or Shu's demethanizer would become inoperable for their intended purpose, i.e., failing to produce an overhead fraction from the demethanizer which contains nearly pure methane. (See e.g., Shu, column 3, lines 59-60). Further, the Action at page 5 specifically states that "Shu desires to cool the vapor stream to a <u>very low temperature</u> to remove <u>methane</u> from heavier hydrocarbons." Thus, while the Action acknowledges a relationship between low temperature

and methane recovery, the Action ignores such thermodynamic principles in an attempt to present an obviousness rejection. As detailed in the previous response, the turboexpander and/or the demethanizer of Shu would be inoperable for their intended purpose while attempting to process the claimed feed because Shu's turbo-expander could not provide cool enough temperatures because of condensation of the claimed heavier constituents or would fail due to excessive liquids being formed. As such, an inoperable reference cannot form a basis for a *prima facie* case of obviousness. *Gordon,* 221 U.S.P.Q. at 1127.

Further, with respect to claim 12, the Action acknowledges at page 5 that Shu fails to disclose the three claimed cooling sources. Yet, the Action attempts to present a *prima facie* case of obviousness by starting, in part, that "the cooling sources would not affect the outcomes of the process." Applicants traverse.

Cooling sources do effect the outcome of processes. As discussed above, Shu's cooling sources would result in an inoperable process with the claimed feed, thereby effecting the outcome of a process. Further, the Action fails to present any motivation in any of the cited references for the claimed three cooling sources. Accordingly, the Action has not presented a *prima facie* case of obviousness because it ignores the express teaching of the reference and/or engages in hindsight reconstruction.

Further, Yao, Campbell and Foglietta, individually or in combination, fail to remedy the deficiencies of Shu. All of these references require turboexpansion of their gaseous feeds. (See Yao, Figures 2 and 5 showing turboexpander 31; Campbell, Figures 4-10 showing turboexpander 17; Foglietta, Figure 1 showing turboexpander 75). As such, these references cannot provide the required cooling through turboexpansion for the feed streams as recited in the present application and cannot provide the recited cooled and substantially condensed liquid hydrocarbon feed streams because of their required turboexpansion schemes.

In establishing a *prima facie* case of obviousness, the cited references must be considered for the entirety of their teachings. *Bausch & Lomb, Inc. v. Barnes-Hind, Inc.*, 230 U.S.P.Q. 416, 419 (Fed. Cir. 1986). It is impermissible during examination to pick and choose from a reference only so much that supports the alleged rejection. *Id.* Thus, the express teachings of Shu, which would lead one away from the invention defined by claim 1, 12 and 14, may not be ignored during examination.

To arrive at the present invention as defined by claim 1 12 and 14, the Action not only ignored the express teaching of Shu, but also engaged in hindsight reconstruction because none of the documents of record teach or suggest the process as claimed, as the cited references, i.e., Shu, Yao, Campbell and Foglietta, all require turboexpansion of their feeds. It is well established that hindsight reconstruction of a reference does not present a *prima facie* case of obviousness and any attempt at hindsight reconstruction using Applicants' disclosure is strictly prohibited. *In re Oetiker*, 24 U.S.P.Q.2d 1443, 1445-46 (Fed. Cir. 1993).

Thus, Shu, Yao, Campbell and Foglietta, individually or in combination, fail to teach the present invention as set forth in independent Claims 1, 12 and 14

Summary

Therefore, Applicants respectfully submit that independent claims 1, 12 and 14, and all claims dependent therefrom, are patentably distinct. This application is believed to be in condition for allowance. Favorable action thereon is therefore respectfully solicited.

Should the Examiner have any questions or comments concerning the above, the Examiner is respectfully invited to contact the undersigned attorney at the telephone number given below.

The Commissioner is hereby authorized to charge payment of any additional fees associated with this communication, or credit any overpayment, to Deposit Account No. 08-2461.

Respectfully submitted,

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